A summary of recent notable ET events over Eastern Canada

IWET4 - May 2012
Chris Fogarty – Canadian Hurricane Center
Canadian Hurricane Center Response Zone

On average, 1 or 2 storms directly affect Canadian land regions each year. Another 2 or 3 typically threaten our offshore waters.
Severe Tropical Cyclone Related Events in Canada 1851-2010

- “Saxby Gale” Oct 1869
- “Great Nova Scotia Cyclone” Aug 1873
- “Galveston Hurricane” Sept 1900
- “Great August Gale” 1927
- “Hazel” Oct 1954
- “Edna” Sept 1954
- “Escuminac Disaster” Jun 1959
- “Beth” Aug 1971
- “Juan” Sept 2003
- “Igor” Sept 2010
Storms affecting Canadian territory in 2011

HURR Irene 2011 Track and SST

HURR Katia 2011 Track and SST

HURR Maria 2011 Track and SST

HURR Ophelia 2011 Track and SST
Track Map of Hurricane Irene
High-resolution wind imagery from SAR (Canadian RadarSat)
Impacts/Notes

• Heavy rainfall in southern Quebec caused flooding on already-saturated soil
• Some bridge/road washouts – 1 fatality
• Enhanced winds due to topography and frontogenesis
• Broken tree limbs and power disruptions

• First heavy impact of a TC in Quebec since Frances in 2004 (primarily rainfall event) and Hugo in 1989 (primarily wind event)
• Identified opportunities for improvement in Operations regarding inter-provincial/national communication
Track Map of Hurricane Katia

HURR Katia 2011 Track and SST

- Tropical Depr.
- Tropical Storm
- Hurricane
- PT (Hurricane–Force)
- PT (Tropical Storm–Force)

Map showing the track of Hurricane Katia from 00 UTC 28 Aug to 12 UTC 12 Sept, with temperature gradient indicated by color scale from 10 to 30.

Source: Environment Canada
Impacts/Notes

- Heavy surf along southern coast of Nova Scotia / Newfoundland created hazard to public

- Special alert issued for eastern Newfoundland for “rapid tide” effect – only the second ever official alert from CHC for the TC-induced wave (first was during Alex 2004)

NEW - SPECIAL STATEMENT FOR EASTERN NEWFOUNDLAND:

WITH THE PASSAGE OF HURRICANE KATIA WELL OFFSHORE OF NEWFOUNDLAND, ITS RAPID FORWARD SPEED OF TRAVEL OVER THE SOUTHERN GRAND BANKS MAY TRIGGER SUDDEN TIDE-LIKE FLUCTUATIONS IN HARBOUR WATER LEVELS OVER EASTERN NEWFOUNDLAND. THE MOST PROBABLE PERIOD FOR THIS EFFECT WOULD BE SATURDAY AFTERNOON/EARLY EVENING, AND AREAS MOST SUSCEPTIBLE TO THIS RANGE FROM THE SOUTHERN AVALON TO THE BONAVISTA PENINSULA. TROPICAL STORMS THAT HAVE TRACKED RAPIDLY (MOVING OVER 100 KM/H) ACROSS THE GRAND BANKS IN THE PAST HAVE TRIGGERED WATER LEVELS TO RISE AND FALL 2 OR 3 TIMES OVER THE SPAN OF AN HOUR AND FLUCTUATE BY AS MUCH AS 2 OR 3 METRES (6 TO 10 FEET). THIS IS AN ADVISORY THAT THIS MAY - REPEAT MAY - OCCUR AND INTERESTS ALONG THE COAST SHOULD AT LEAST BE ON THE WATCH FOR THIS POSSIBILITY. PREDICTING THE ACTUAL WATER LEVEL CHANGES FOR VARIOUS HARBOURS IS VERY DIFFICULT. THE HIGH (NATURAL) TIDE IN THE REGION WILL BE IN THE 7:30 TO 8:30 PM TIMEFRAME SATURDAY, WHEN SUCH EFFECTS WOULD HAVE MORE OF AN IMPACT WERE THEY OCCUR.

water level fluctuations did occur, but fortunately not at high tide.
Track Map of Hurricane Maria

Cold wake from slow-moving Hurricane Katia

18 UTC 16 Sept

Absorbed by larger non-tropical low

06 UTC 16 Sept

18 UTC 15 Sept

00 UTC 14 Sept

00 UTC Sept 12

00 UTC 10 Sept

00 UTC 7 Sept
Impacts/Notes

- No significant impact over land
- Particular forecast challenge with respect to wind field expansion during ET / limited wind field data
- Hurricane Warning did not verify – low-end tropical storm conditions observed
- Operationally declared a hurricane landfall – reduced to TS during off-season
Track Map of Hurricane Ophelia
Heavy rainfall impact from Ophelia

Culvert dislodged (a recent replacement after Igor in 2010) (southeastern Newfoundland)

Heavy runoff-induced rockslide
Forecast philosophy for Ophelia

- In the wake of Hurricane Maria (~ 3 weeks prior) the Centre was conservative with forecasts
- Maintained a Tropical Storm *Watch* throughout event
- TS conditions were observed
- Did not want to over-warn this event
- Turned out to be a good balance - an example of applying discretion
Another opportunistic SAR scan capturing wind field early in the ET process
Other Notes from 2011 season
In addition to Tropical Storm Gert, we are monitoring a compact low-level circulation about 450 km south-southeast of Halifax which has been spawning convection intermittently overnight and early this morning. Sunday evening’s ASCAT pass showed a small band of 25 to 30 knot winds on the right side of this circulation. The CHC will continue monitoring this area for strong winds. The marine forecast for East Scotian Slope and Laurentian Fan has been amended to reflect this “Wannabe” tropical cyclone.

Similar structure / pattern to “Unnamed” TS (#12) about 2 weeks later

“Wannabe” cyclone of mid Aug 2011

These types of systems appear in this region about once every other season

“TS Gert”
As in 2010, some late-season TCs are tapped-into by far-reaching cold fronts to the north which can raise flooding potential.
Track Map of Hurricane Earl
1000-500 hPa geopotential thickness and sea level pressure 12Z 4 Sept 2010

Central pressure was actually ~960 hPa

Halifax
1225Z 4 Sept 2010 – GOES Enhanced IR
From the CMC WOCN31 bulletin at 3pm Friday 03 Sept 2010:

...Wind warnings for gusts between 90 and 110 km/h. Gusts of this speed could cause tree branches and limbs to break and some trees to come down. That could result in downed utility lines and related power failures. There could also be some damage to signage, roofing materials and building cladding. Gusts possibly to 130 km/h remain a concern which could exacerbate these impacts...

Observed winds from Hurricane Earl in the impact area depicted in photographs:

<table>
<thead>
<tr>
<th>Location</th>
<th>KM/h</th>
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<tbody>
<tr>
<td>BEAVER ISLAND</td>
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<tr>
<td>MCNABS ISLAND</td>
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<td>OBESBORNE HEAD</td>
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<td>115</td>
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<tr>
<td>HALIFAX DOCKYARD</td>
<td>109</td>
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</tbody>
</table>
Track Map
of Hurricane Igor
1000-500 hPa geopotential thickness and sea level pressure 12Z 21 Sept 2010

Central pressure was actually ~950 hPa

Halifax
1215Z 21 Sept 2010 – GOES Enhanced IR
RadarSat SAR Imagery of Hurricane Igor and Frontal Interaction

NRCS RSat 0955Z 21 SEPT 2010

Marine Observations at 10Z 21 SEP 2010

GEM REG (Par) 09Z SLP and 1000-500 TH
Brian Kelly comments: Hurricane Igor blows a 20 yr old blue spruce down across car.

Curtain wall collapse, Pepperell Place, St. John's (courtesy of Day & Ross Tampsed)

Steve Delaney comments: Parking lot at Mallard Pearl Square at about 4 pm, Sept 21, 2010. Light pole blown over by Igor strikes car and truck. Photo sent in by (Steve Delaney)

Images from Bay Bulls sent by Lara Williams.

Fallen trees in St. John's

Three trees blown down by Hurricane Igor along Wishingwell Road in St. John's.
(Submitted by Tommy Browne)
Total Precipitation Aug 29-30 2009
Précipitation totale 29-30 août 2009
City of Saint John, NB after Hanna’s Passage
“Worst rain in 1-2 decades”